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(71) Applicants
Mitutoyo Mfg Co. Ltd.,
33—7 Shiba 5-chome,
Minato-ku, Tokyo, Japan
(72) Inventor
Yasuyuki Yamaryo
(74) Agents
Page, White and Farrer,
27 Chancery Lane,
London WC2A 1NT

(54) Dust excluding fasteners

(57) A dust excluding device for a linear scale comprises a movable member 24D movable between resilient shield members provided with connecting means such as ribbed vinyl fasteners 32A, 32B or rubber magnets (44A, 44B) along the opposed surfaces of the shield members, and local opening or closing means such as peeling wedges 34A, 34B and connecting plates 36A, 36B provided in front and at the back of the movable member 24D in the direction of movement of the movable member.

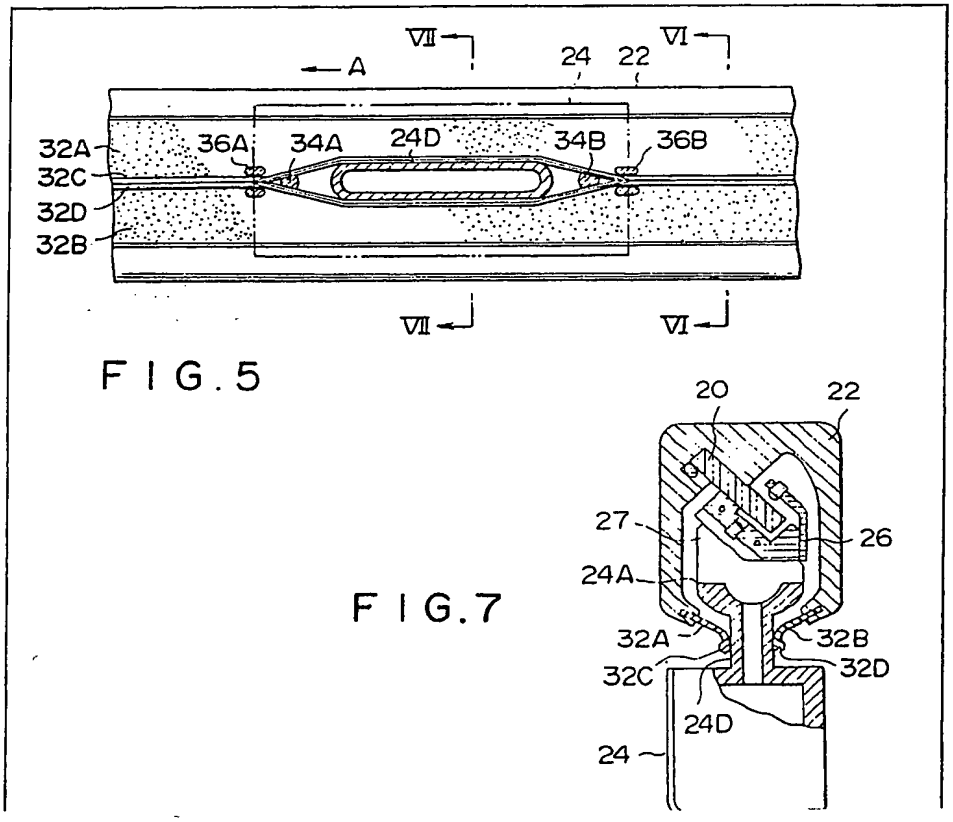


FIG.5

FIG.7

GB 2 094 395

FIG. 1
PRIOR ART 1

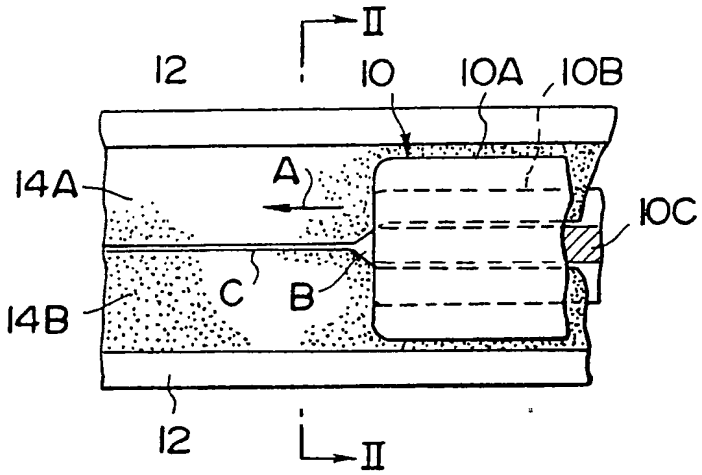


FIG. 2
PRIOR ART 1

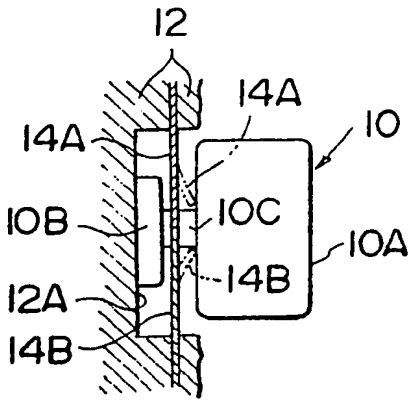


FIG. 3
PRIOR ART 2

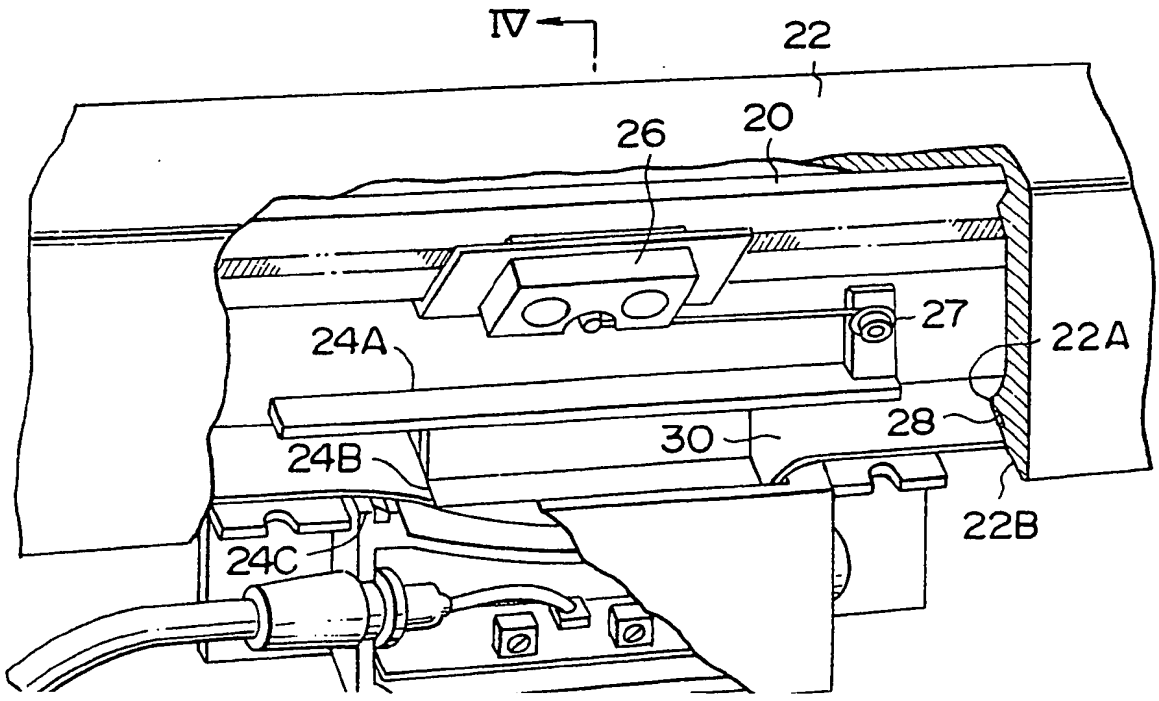


FIG. 4
PRIOR ART 2

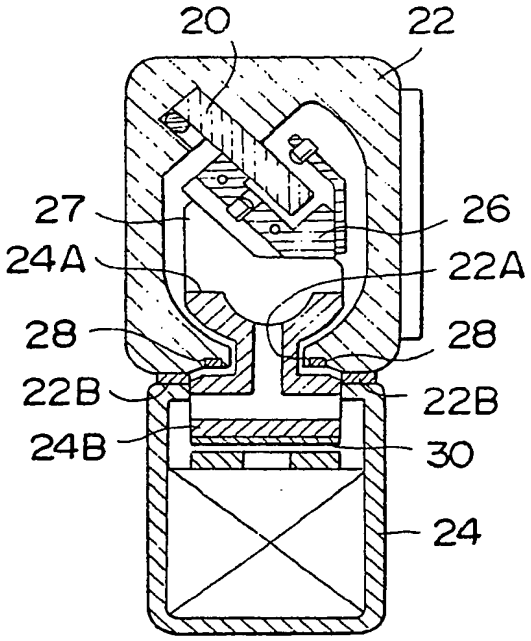


FIG. 5

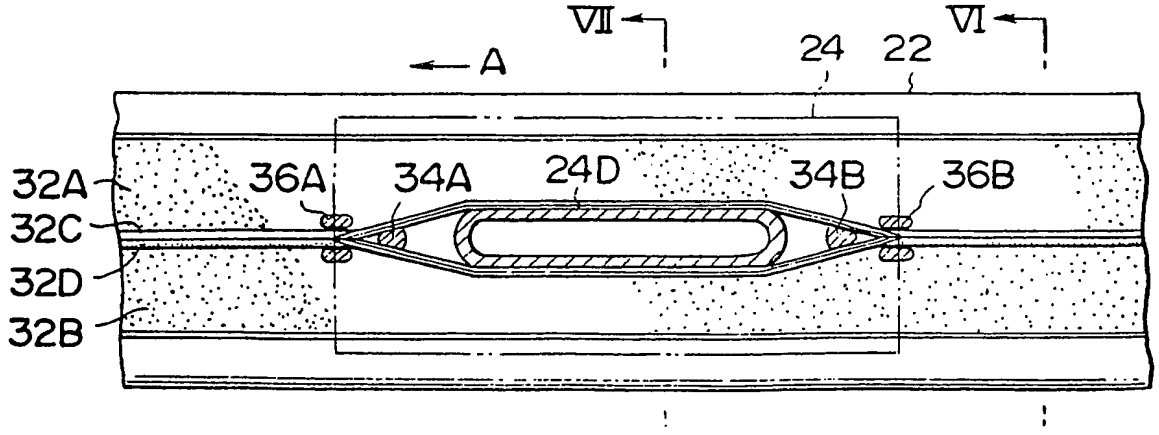


FIG.6

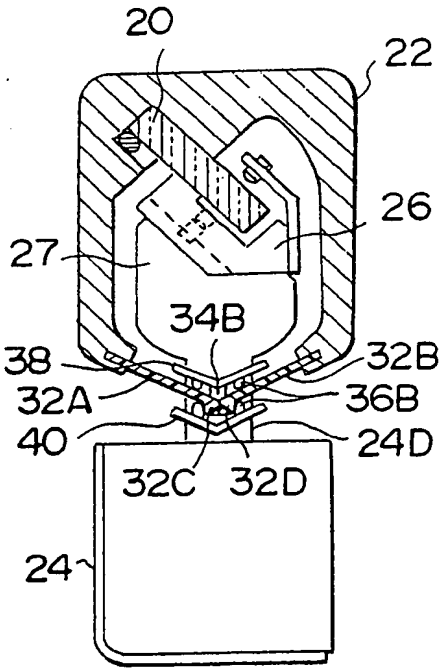


FIG.7

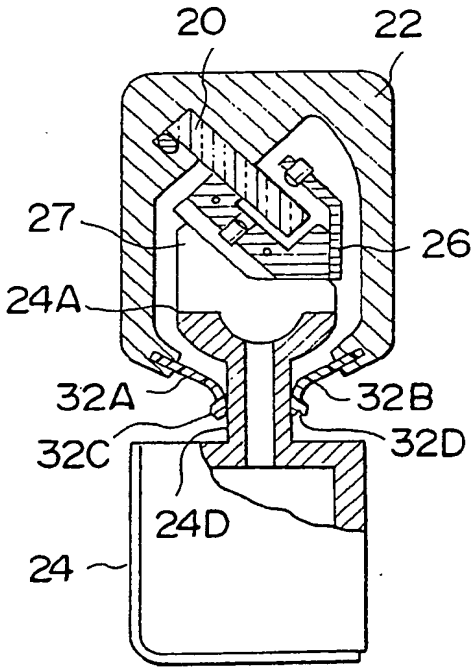
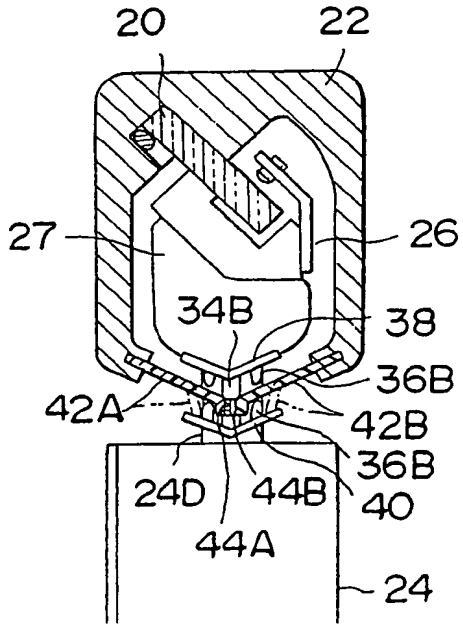


FIG.8



SPECIFICATION

Dust excluding device

This invention relates to dust excluding devices, and particularly to improvements in a dust excluding device suitable for use in a linear scale, for excluding dust while allowing mobility of a movable member, by use of shield members having elasticity and being divided into two along the line of movement of the movable member.

Linear scales are known in which graduations are provided on a scale mounted on a fixed member which is automatically read by a detecting element in a slider mounted on a movable member. In linear scales of this type dust excluding devices have been used as shown for example in Figs. 1 and 2. Referring to the drawings, designated at reference numeral 10 is a slider movable on a slidably guiding surface 12A of a fixed frame 12 in a direction indicated by an arrow A in Fig. 1 (in a direction perpendicular to the surface of paper in Fig. 2), and this slider 10 includes a main body 10A, a leg 10B disposed downwardly of the main body 10A and a thin neck portion 10C connecting the main body and leg to each other. The slidably guiding surface 12A is covered, for example, by shield members 14A, 14B made of rubber, having elasticity and being divided into two along the line of movement of a slider, which is a movable member, and these shield members 14A, 14B are each solidly secured at one end thereof to the fixed frame 12 and in contact at the other end with each other. Consequently, at a portion where the slider 10 is not present, the slidably guiding surface 12A is covered by a pair of shield members 14A, 14B as indicated by solid lines in Fig. 2, so that dust can be prevented from entering onto the slidably guiding surface 12A. When the slider 10 moves in the direction indicated by the arrow A, the shield members 14A, 14B are pushed open as indicated by two-dot chain lines in Fig. 2, and, in this case, gaps B are formed between both shield members 14A and 14B at portions in front and at the back of the slider 10, with the result that dust enters onto the slidably guiding surface 12A through the gaps B. Furthermore, with the dust excluding device as described above, dust not only enters onto the slidably guiding surface 12A through the gaps B formed by roll-ups of the shield members during the movement of the slider 10 but also a very small gap C is present between the pair of shield members 14A and 14B which cover the slidably guiding surface even when the slider 10 is not moving, allowing dust to enter therethrough, so that dust cannot be completely prevented from being attached onto the slidably guiding surface 12A.

To obviate the abovedescribed disadvantages, in Japanese Utility Model No. 72738/77, the applicant has proposed a scale graduation reading device as shown in Figs. 3 and 4, comprising: a hollow housing 22 incorporating therein a in a longitudinal direction of the scale 20 and provided along the guide groove 22A with sliding surfaces 22B; and a slider 24 having an extension 24A extending from the exterior of the housing 22 through the guide groove 22A into the housing 22 and provided at the forward end of the extension 24A thereof with a detecting element carrying member 27 carrying a detecting element 26 for reading the graduations on the scale 20; wherein said scale graduation reading device further comprises: magnets 28 embedded in portions adjacent the sliding surfaces 22B along the guide groove 22A; a magnetic strap 30 fixed at opposite ends thereof to the housing 22, extending along the guide groove 22A and adapted to be attracted to an opening of the guide groove 22A by the magnets 28 to cover the guide groove 22A over the entire length thereof; a convexed arcuate guide 24B provided on the extension 24A of the slider 24, and being slidable on the rear surface of the strap 30 to raise the strap 30 from the opening of the guide groove 22A only in the slider 24; and pressure members 24C provided on the outer peripheral portions for pressing the strap 30 against the opening of the guide groove 22A. In this dust excluding device of the scale graduation reading device, the strap 30 serving as a shield member is adapted to move in a direction perpendicular to the surface of the opening of the housing 22, the main body and the extension of the slider cannot be connected rectilinearly with each other, thus presenting such a disadvantage that the device becomes complex in construction, and moreover, large in size.

The present invention has been developed to overcome or minimise the abovedescribed disadvantages and has as its object the provision of a dust excluding device for reliably securing a dust excluding performance without rendering the device large in size.

To achieve the abovedescribed object, according to the present invention, there is provided a dust excluding device for excluding dust while allowing mobility of a movable member, comprising shield members having elasticity and being divided into two along the line of movement of the movable member, means for connecting said shield members being provided along the divided and opposed surfaces of the shield members, and local opening or closing mechanisms capable of opening or closing the connecting means being provided in front and at the back of the movable member in the direction of movement of the movable member.

In one embodiment of the invention, the connecting means is formed of vinyl fasteners.

In another embodiment of the invention the connecting means is formed of a rubber magnet.

Preferably the said local opening or closing mechanisms comprise peeling wedges being tapered in cross section and connecting plates provided at positions adjacent opposite sides of said connecting means

to the accompanying drawings, in which:—

Fig. 1 is a top view showing a known dust excluding device in which only the conventional shield members of the prior art are used,

Fig. 2 is a cross-sectional view taken along the line II—II in Fig. 1,

Fig. 3 is a perspective view, partly cutaway, showing a dust excluding device in which the magnets and the magnetic strap of the prior art are used,

Fig. 4 is a cross-sectional view taken along the line IV—IV in Fig. 3,

Fig. 5 is a longitudinal sectional view showing the slider portion in the linear scale in which is provided a first embodiment of the dust excluding device according to the present invention,

Fig. 6 is a cross-sectional view taken along the line VI—VI in Fig. 5,

Fig. 7 is a cross-sectional view taken along the line VII—VII in Fig. 5, and

Fig. 8 is a cross-sectional view showing the linear scale in which is provided a second embodiment of the dust excluding device according to the present invention.

As shown in Figs. 5 and 6, a first embodiment of the present invention is of such an arrangement that, a dust excluding device for excluding dust while allowing mobility of a slider 24 comprises shield members 32A, 32B having elasticity and being divided into two along the line of movement of the slider 24, the shield members 32A, 32B are each formed of a vinyl material being of a substantially letter 'V' shape having its vertex positioned at one of the divided and opposed surfaces of the shield members, vinyl fasteners 32C, 32D integrally formed on the shield members 32A, 32B, respectively, are provided along the divided and opposed surfaces of the shield members 32A, 32B, and local opening or closing mechanisms are provided in front and at the back of the slider 24 in the direction of movement of the slider 24 which comprise peeling wedges 34A, 34B capable of opening the vinyl fasteners 32C, 32D, connecting plates 36A, 36B capable of closing the vinyl fasteners 32C, 32D, and upper and lower plates 38, 40 for supporting the peeling wedges 34A, 34B and the connecting plates 36A, 36B in a manner to clampingly hold them from above and below of the shield members 32A, 32B. Additionally, an extension 24A of the slider 24 is connected to the main body thereof rectilinearly through a neck portion 24D.

In use, with the slider 24 moving to the left with respect to the housing 22 as indicated by an arrow A in Fig. 5, the leftward movement of the slider 24 causes the connecting plates 36A and the peeling edge 34A to move to the left. Consequently, as shown in Fig. 7, only those portions of the shield members 32A, 32B in contact with the slider 24 are peeled, and the slider 24 can smoothly move to the left. In this case, the peeling edge 34B and connecting plate shield members 32A, 32B coming out of contact with the slider 24 are connected to each other again through the action of the connecting plate 36B. Consequently, the shield members are not excessively opened at a portion where the slider is not present. In the case where the slider moves in a direction opposite to the above, only the actions of the peeling wedges and connecting plates are reversed and the functions are identical with those in the above case.

In this embodiment, the connecting means consists of the vinyl fasteners, which are integrally formed on the shield members 32A, 32B, respectively, so that the shield members and connecting members can be easily produced.

Furthermore, in this embodiment, the shield members 32A, 32B are each disposed in a substantially letter 'V' shape with the vertex thereof positioned at one of the divided and opposed surfaces of the shield members, whereby the vinyl fasteners can be easily peeled from or connected to each other, and the vinyl fasteners can be reliably brought into contact with the neck portion 24D of the slider when peeled.

In addition, in this embodiment, use of the peeling wedges makes it possible to reliably peel the shield members. If further the opposite ends of the neck portion 24D of the slider 24 are formed into wedge shapes in cross-section, then the peeling wedge can be omitted.

Fig. 8 shows a second embodiment of the present invention, in which the shield members 42A, 42B are made of rubber as in the prior art and rubber magnets 44A, 44B are provided at the divided and opposed surfaces of the shield members as the connecting means. This embodiment is similar to the first embodiment in other respects and actions, so that detailed description will be omitted.

In this embodiment, the slider 24 can move smoothly against the comparatively weak connecting force of the rubber magnets.

In addition, in this second embodiment, the peeling wedges and connecting plates as in the first embodiment have been used. However, if the connecting attracting forces of the rubber magnets are satisfactorily strong, then the connecting plates may be omitted.

In each of the above described embodiments, the present invention has been applied to the graduation reading device portion of the linear scale. It should be understood, however, it is apparent that the invention is not limited in its scope of application to the specific forms as described above and that it is similarly applicable to sliding portions of machines and apparatus in general.

As has been described hereinabove, the present embodiments of the invention can offer such outstanding advantages that reliable dust excluding performance can be obtained without rendering the device large in size.

while allowing mobility of a movable member, comprising shield members having elasticity and being divided into two along the line of movement of said movable member, wherein connecting means for said shield members are provided along the divided and opposed surfaces of said shield members, and local opening or closing mechanisms capable of locally opening or closing said connecting means are provided in front and at the back of the movable member in the direction of movement of said movable member.

2. A dust excluding device according to claim 1, wherein said connecting means comprises vinyl fasteners.

3. A dust excluding device according to claim 1, wherein said connecting means comprises rubber magnets.

4. A dust excluding device according to any one of claims 1, 2 or 3 wherein said local opening or closing mechanisms comprise peeling wedges being tapered in cross-section and connecting plates provided at positions adjacent opposite sides of said connecting means.

5. A dust excluding device substantially as hereinbefore described with reference to Figs. 5 to 7 or Fig. 8 of the accompanying drawings.

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